Amendments to the Specificati n:

Please replace the paragraph, beginning at page 1, line 1, with the following rewritten paragraph:

This application is a continuation-in-part of U.S. Application Serial No. 08/878,372 filed June 18, 1997 now abandoned.

Please replace the paragraph, beginning at page 8, line 25, with the following rewritten paragraph:

FIG. 5C is an alternate embodiment of the device of FIG. 5A ~~and 5B,~~ showing the use of an internal snubber made to be removable from outside the reactor vessel without disturbing the reactor vessel contents or evacuated shell.

Please replace the paragraph, beginning at page 12, line 26, with the following rewritten paragraph:

FIG 1A is a flow diagram that depicts the flow scheme of the present invention in a cooling mode for the phase separator 50 and the reaction vessel 110, which contains isothermal mixing baffles 400 and the helical channel coil 100 fixed to the outer surface of reaction vessel 110. For the purposes of illustration only one baffle is shown. In a preferred embodiment the helical channel coil 100 may also extend to cover the upper head 112 and lower head 113 of reaction vessel 110. Low "quality" (low vapor content) working fluid shown by arrow 10 enters the phase separator 50 and is split into a vapor phase shown by line 13 and a liquid phase shown by line 11, the separation effected by gravitational means. The liquid phase 11 from the phase separator is piped to the isothermal mixing baffle(s) 400, wherein it changes into a vapor shown by line 12 by boiling and absorbing thermal energy from the contents inside the reaction vessel 110. The vapor 13 emanating from the phase separator 50 is commingled with the vapor 12 generated in the isothermal mixing baffles 400 in a mixing chamber 60. The now combined vapor streams shown by line 14 are fed into the helical channel coil 100, wherein the vapor absorbs sensible thermal energy from the content inside the reaction vessel ~~100~~ 110 until it exits the channel coil via line 15 at a temperature very close to that of the average temperature of the reactor content.

Please replace the paragraph, beginning at pages 12-13, line 2, with the following rewritten paragraph:

FIG 1B is a flow diagram that depicts the flow scheme of the present invention in a heating mode for the phase separator 50 and the reaction vessel 110, which contains the isothermal mixing baffle(s) 400 and the helical channel coil 100 fixed to the outer surface of reaction vessel 110. In a preferred embodiment the helical channel coil 100 may also extend to cover the upper head 112 and lower head 113 of reaction vessel 110. High "quality" (mostly vapor content) working fluid shown in line ~~10~~30 enters the phase separator 50 and is split into a vapor phase shown by line 13 and a liquid phase shown by line 11, the separation effected by gravitational means. The vapor phase 13 from the phase separator 50 is piped to the isothermal mixing baffle(s) 400, wherein it changes into a liquid ~~shown as line 12~~ by condensing and delivering thermal energy to the content inside the reaction vessel 110. The liquid 11 emanating from the phase separator 50 is commingled with the condensate in line ~~12~~32 generated in the isothermal mixing baffle(s) 400 in a separate mixing chamber 60. The now combined liquid streams in line ~~14~~36 are fed into the channel coil 100, wherein the liquid

delivers sensible thermal energy to the content inside the reaction vessel 110 until it exits the channel coil in line 15 at a temperature very close to that of the average temperature of the reactor content.

Please replace the paragraph, beginning at page 14, line 7, with the following rewritten paragraph:

As shown in FIG. 2B, in ~~In~~ an alternate embodiment, the cylindrical section ~~111~~ 120 of reaction vessel 110 of FIG. 1A and 1B can be ~~replaced with~~ fabricated as a conical ~~section~~ reactor 114 having a tapered wall 125 and two "dished" heads, a larger upper head 115 and a smaller lower head 116 ~~as shown in FIG. 2B~~. This alternate embodiment allows for better mixing of the contents and is advantageous in applications where gaseous reaction by-products are generated in the reaction vessel content.

Please replace the paragraph, beginning at page 14, line 13, with the following rewritten paragraph:

FIG. 3A is a cross-sectional view of the cylindrical reaction vessel 110 of with integral channel coil 100 and integral isothermal mixing baffle 400 (one only shown for simplicity). FIG. 3B is a cross-sectional view of an conical reactor 114 ~~alternate embodiment of reaction vessel 110 with truncated cone portion replacing the cylindrical portion~~ with integral channel coil 100 and integral isothermal mixing baffle 400 (one only shown for simplicity). FIG. 2A, FIG 2B, FIG. 3A and FIG. 3B show two characteristics of channel coil 100, which combine to add mechanical strength to reaction vessel 110. The first is that the point of contact 130, 131 is a right angle to the reaction vessel wall 120, 125 respectively in the vertical section of the reaction vessel ~~111~~ 110 or the tapered wall section of conical reactor 114, as well in the upper heads 112, 115 and lower heads 113, 116 respectively. That is, walls 121 and 123 form a right angle with walls 120 and 125. In the preferred embodiment shown in FIG. 1A and 3A, walls 121 and 123 must form a right angle with the axis of the cylinder reaction vessel 110 having a vertical cylindrical section where the channel coil is fixed to the wall 120. In the upper 112 and lower 113 head sections of the reaction vessel 110, walls 121 and 123 are perpendicular to the line tangent to the convex (external) surface of the head, 112 or 113, where the tangent point is at the bisector between 121 and 123. The channel coil 100 surrounding wall 120 of vessel 110 and wall 125 of vessel 114 can be covered with insulation 700.

Please replace the paragraph, beginning at pages 14-16, line 31, with the following rewritten paragraph:

The same effect is achieved for the reaction vessels of FIG. 2B and 3B where the vertical section has cone shape wall 125 by fixing portions 121 and 123 perpendicular to wall 125. The perpendicularity of portion 121 and 123 of channel coil 100 to wall 120 or wall 125 of the reaction vessel 110 or 114 is required in order to meet the criteria established by section UG-28 of the ASME Boiler And Pressure Vessel Code Section VIII Division 1 so that elements 121, 122 and 123 can be considered as adding strength to the wall 120 under external pressure. The second characteristic adding strength to reaction vessel 110 concerns the pitch at which the ~~helical channel coil 100 is affixed to the reaction vessel wall 120. For the vertical portion~~ (cylindrical or tapered wall) of the reaction vessel 110 or 114, the pitch is the slope of the coil 100, with respect to a horizontal radial plane which is perpendicular to the vertical axis of the reactor. A larger slope is considered a higher pitch. The channel coil 100 is affixed at a pitch

less than or equal to a maximum pitch, which is that pitch beyond which the desired improvements in the reaction vessel wall 120, 125 section modulus are no longer achieved, as dictated by the rules of pressure vessel design codes such as ASME Section VIII, Division 1, sections UG-27 and UG-28 thereof. Section UG-27 explains how to calculate "Thickness of Shells Under Internal Pressure", and section UG-28 describes how to calculate "Thickness of Shells and Tubes Under External Pressure". Exactly what this pitch is will depend on many factors. ~~including~~ As to reaction vessel 110 or 125 these include the diameter of reaction vessel 110, the average diameter of vessel 114, the material of construction of the reaction vessel ~~110~~ and the operating parameters for which the reactor is designed. As the pitch (or slope) of the coil increases, the distance between successive coils increases. The coil is made of elements 121 and 123 that are perpendicular to the vessel wall, 120, 125 which allows for the vessel, under the rules of pressure vessel design codes such as ASME Section VIII, Division 1 to take credit for the reinforcement to reaction vessel wall 120 125. As the distance between successive coils increases the degree of reinforcement decreases. At some point, the degree of reinforcement becomes too low and reaction vessel wall 120, 125 becomes too weak for the desired function. The reinforcement required will depend upon the differential pressure between the inside and outside of reaction vessel wall 120, 125. This is a design parameter easily calculated by one skilled in the art. Thus, the maximum pitch of channel coil 100 will depend on the designed maximum operating pressure for reaction vessel 110, 114 among other factors. For example for the head sections 112, 113 of the reaction vessel 110 ~~112 and 113~~, the pitch is the distance of each helical 360° course of the coil 100, with respect to the previous and/or subsequent helical 360° course. A greater separation is considered a higher pitch. The channel coil 100 is fixed at a pitch less than or equal to a maximum pitch, which is that pitch beyond which the desired improvements in the reaction vessel wall 120 section modulus are no longer achieved, as dictated by the rules of pressure vessel design codes such as ASME Section VIII, Division 1, sections UG-27 and UG-28 thereof. Section UG-27 explains how to calculate "Thickness of Shells Under Internal Pressure", and section UG-28 describes how to calculate "Thickness of Shells and Tubes Under External Pressure". Exactly what this pitch is will depend on many factors including the diameter of reaction vessel 110, the material of construction of the reaction vessel 110 and the operating parameters for which the reactor is designed. As the pitch (separation) of the coil 100 fixed to the upper or lower heads 112 and 113 of reaction vessel 110 increases, the distance between successive coils increases.

Please replace the paragraph, beginning at page 16, line 16, with the following rewritten paragraph:

The point of contact 130 between reaction vessel wall 120 and channel coil ~~110~~ 100 of reaction vessel 110 and the point of contact 131 between reactor vessel wall 125 and channel coil 100 of reactor vessel 114 (FIG. 2A, 3A and FIG. 2B, 3B respectively) is a right angle, and the pitch of the channel coil 100 is less than or equal to the maximum pitch. These two factors combine to increase the section modulus of the reaction vessel 110. Under the rules of pressure vessel design codes such as ASME Section VIII, Division 1, section UG-28 thereof this resultant increase in the section modulus, due to the channel coil 100, allows the reaction vessel wall 120 be thinner than that which would otherwise be required when the channel coil 100 is not fixed according to the present invention in order to achieve desire maximum allowable pressure for reaction vessel working conditions. Because the reaction vessel wall 120 may be thinner than that which would be required without channel coil 100, improved heat transfer efficiency is achieved. A thinner reaction vessel wall increases the overall heat transfer coefficient across the reaction vessel wall because the thermal resistance resulting from the thermal conductivity of the reaction vessel wall is reduced. Under the rules of pressure vessel design codes such as

ASME Section VIII, Division 1, the greatest advantage of the present invention is realized in larger diameter reaction vessels that operate at relatively low pressures, e.g., up to 10 bar and at full vacuum (FV). Under these conditions, the FV condition inside the reaction vessel dictates the use of thicker wall 120, 125 than otherwise be required to withstand positive internal pressure only. By using the present invention, the wall thickness 120, 125 is controlled by positive internal pressure in the reaction vessel and will be thinner.

Please replace the paragraph, beginning at page 17, line 6, with the following rewritten paragraph:

One additional advantage of the present invention is evident by examining FIG. 8C, which depicts a comparison of a conventional half-pipe jacket cross-section R to that of the present invention with proportional dimensions. The cross-sectional area of a jacket coil 100 in accordance with the present invention, compared to that of a conventional half-pipe jacket coil R of proportional dimensions, is $4/\pi$ or 27% greater. This allows for higher fluid flow for the same unit pressure drop, and thus greater heat transfer.

Please replace the paragraph, beginning at page 17, line 13, with the following rewritten paragraph:

The channel coil 100 may be additionally insulated with insulation 700 attached directly to the three outer sides, 121, 122, and 123, of the coil 100 as shown in Figs. ~~8A~~ 8C ~~or 8B~~. Alternatively, insulation 700 may be wrapped around channel coil 100 and reaction vessel 110 or reaction vessel 114 as shown in FIG. 3A and FIG. 3B, before placement in an evacuation shell. FIG. 4 shows vessel 110 placed incise evacuation shell 300. Insulation 700 may be any suitable material which does not out-gas when evacuated and/or heated. Reflective multi-layer insulation, made of alternating layers of fiberglass cloth, cured of any residues, which would otherwise out-gas when evacuated and/or heated, and aluminum foil are preferred. These alternate layer method of application may varied, e.g. two layers of cloth and one layer of aluminum foil, etc. The "no out-gassing" requirement is essential for the evacuated multi-layer reflective insulation of the preferred embodiment to be successful.

Please replace the paragraph, beginning at page 18, line 24, with the following rewritten paragraph:

FIG. 5A is a partial cross-sectional view of an isothermal mixing baffle of uniform circular cross-section (a cylinder) in accordance with the present invention. In the exemplary embodiment, an isothermal mixing baffle 400 is used where there exists a need to cool the reaction vessel contents. However, such isothermal mixing baffles can also be used where heating of the contents of the reaction vessel, e.g. reaction vessel 110 of FIG. 4 is needed. The isothermal mixing baffle 400 is inserted into the reaction vessel contents through the top head 112 and evacuated shell 300 as shown in FIG. 6A. For cooling, a saturated or subcooled liquid is introduced into the isothermal mixing baffle 400 through an inlet pipe 410. As previously discussed, the liquid is selected primarily because of its boiling point, providing, of course, other factors do not prevent its use, such as availability, cost, reactivity, toxicity, etc. A liquid having a boiling point lower than that of the reaction vessel contents will boil when heat is absorbed from the reaction vessel contents. Fluids which may be used for cooling or heating in the present invention include, but are not limited to nitrogen, brine, steam, chilled water, carbon dioxide, ammonia, CF_4, ethane, ethylene and hot water. Other fluids may also be used depending on the particular needs of the reaction for which the reactor is designed.

Please replace the paragraph, beginning at page 19, line 24, with the following rewritten paragraph:

The ideal temperature (or range of temperatures) of the reaction vessel contents can be determined from the chemistry of the reaction. This temperature, along with the physical characteristics of the isothermal mixing baffle (dimensions, material of construction, number of baffles, etc.) and relevant heat transfer equations, are combined to give rise to a required amount of heat transfer which must occur across the wall 449 (FIGS. 5A, 5B, 5C, and 5D) of the isothermal mixing baffle 400 in order to maintain the reactor contents at the desired temperature. From this required value of heat transfer, a fluid is selected such that the latent heat of vaporization plus any sensible heat transfer occurring from any rise in temperature of the fluid to its boiling point, will give the desired total heat transfer. It should be noted that a fluid with precisely the right characteristics does not have to exist for accurate control of the temperature. Controlling the flow rate of the fluid into the isothermal mixing baffle 400 or the liquid level thereof will allow for fine tuning the heat transfer and corresponding temperature of the reactor contents. Further, controlling the pressure of the liquid could help alter its boiling point and fine tune the cooling power and range of the liquid. The selected fluid need only fall within a range of necessary heat transfer requirements. Where heating is desired, as shown in FIG 1B, a hot gas, such as gaseous ammonia, is introduced via line 13 into isothermal mixing baffle 400, the condensed ammonia in line ~~12~~ 32 is then combined with other condensed ammonia in line 11 emanating from the phase separator 50 and introduced via line ~~14~~ 36 into the channel coil 100. This hot gas and resultant condensate then heats the contents of reaction vessel 110.

Please replace the paragraph, beginning at page 21, line 1, with the following rewritten paragraph:

FIG. 5A ~~and FIG 5B also~~ shows a sintered, porous metal phase separator or "snubber" 411 placed at the end of inlet pipe 410. The snubber 411 curtails the flow of the liquid into or out of the isothermal mixing baffle, just as a kitchen faucet nozzle controls the water flow into a sink, thereby minimizing splashing. Snubber 411 also serves to disengage and allow the phases to separate inside the isothermal mixing baffle.

Please replace the paragraph, beginning at pages 21-22, line 22, with the following rewritten paragraph:

FIG. 5A ~~and FIG. 5B also~~ shows means for detecting the level of liquid in the isothermal mixing baffle 400. A dual leg dip tube 440 is inserted into the isothermal mixing baffle 400. The top opening 445 of the dip tube 440 is near the top of the isothermal mixing baffle 400, and the bottom opening 447 of the dip tube 440 is near the bottom of the isothermal mixing baffle 400. The level of liquid 450 in the isothermal mixing baffle 400 is maintained below the top opening 445 and above the bottom opening 447 of the dip tube. The pressure differential is detected as the pressure of the head of liquid in the dip tube. The pressure at the top opening 445 is the pressure of the gas above the liquid 450. The pressure at the bottom opening 447 is the pressure of the gas above the liquid 450 plus the pressure caused by the weight of the liquid ~~450 which is above the bottom opening 447. The pressure created by the weight of liquid 450~~ above the bottom opening 447 can be found by subtracting the value of the pressure at the top opening 445 from the value of the pressure at the bottom opening 447. This pressure can be used (in conjunction with the density of the liquid) to calculate the height of liquid above the

bottom opening 447. FIG. 5B shows the mixing baffle 400 inserted through the bottom of the reactor vessel. In this instance the top opening is 446 and the bottom opening 449 of dip tube 440.

Please replace the paragraph, beginning at page 22, line 10, with the following rewritten paragraph:

FIG. 5E and 5F are alternative embodiments 470 of the isothermal mixing baffles 400 which employ non-circular cross-sectional geometries, such as ellipsoids and airfoils 449. These alternative embodiments may be prescribed to augment surface area and/or direct the flow of reactor contents to enhance mixing.

Please replace the paragraph, beginning at page 24, line 20, with the following rewritten paragraph:

FIG. 8A and 8B show additional embodiments of the cross-sectional shape of channel coil 100. The outside walls ~~122~~ of the channel coil 100 may be of nearly any shape. It is critical, however, that the walls ~~121~~ 701, 702 (FIG. 8A) and 703, 704 (FIG. 8B) ~~and 122~~ are both normal to the outside reaction vessel wall 120. In this configuration, channel coil 100 supports and strengthens reaction vessel wall 120, allowing use of a thinner wall and greater heat transfer.

Please replace the paragraph, beginning at page 25, line 4, with the following rewritten paragraph:

FIG. 9A and 9B are alternative embodiments of FIG. 5A and 5B, respectively, wherein the wall 449a comprises cylindrical sections of different diameters so that the smaller diameter accommodates the trajectory of agitator blades and the larger diameter allows for greater heat transfer area.

In view of the amendments to the specification applicant will, if requested, provide a complete clean copy of the specification without editing notations.